AF/2723

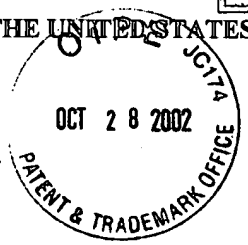
Corres. and Mail

BOX AF

Docket No.: 49959-013

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



In re Application of : RESPONSE UNDER 37 C.F.R 1.116
: EXPEDITED PROCEDURE

Ariel BEN-PORATH, et al. :

Serial No.: 09/111,454 : Group Art Unit: 2723

Filed: July 08, 1998 : Examiner: V. Bali

For: AUTOMATIC DEFECT CLASSIFICATION WITH INVARIANT CORE CLASSES

THE COMMISSIONER FOR PATENTS AND TRADEMARKS
Washington, DC 20231

RECEIVED
OCT 2 9 2002
Technology Center 2600

Dear Sir:

Transmitted herewith is an Amendment in the above identified application.
☒ No additional fee is required.
☐ Applicant is entitled to small entity status under 37 CFR 1.27
☐ Also attached:

The fee has been calculated as shown below:

	NO. OF CLAIMS	HIGHEST PREVIOUSLY PAID FOR	EXTRA CLAIMS	RATE	FEE
Total Claims	58	60	0	$18.00 =	$0.00
Independent Claims	11	8	3	$84.00 =	$0.00
		Multiple claims newly presented			$0.00
		Fee for extension of time			$0.00
					$0.00
				Total of Above Calculations	$0.00

☐ Please charge my Deposit Account No. 500417 in the amount of $0.00. An additional copy of this transmittal sheet is submitted herewith.

☒ The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment, to Deposit Account No. 500417, including any filing fees under 37 CFR 1.16 for presentation of extra claims and any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

Michael A. Messina

Michael A. Messina
Registration No. 33,424

600 13th Street, N.W.
Washington, DC 20005-3096
(202)756-8000 MAM:mcm
Facsimile: (202)756-8087
Date: October 28, 2002

ED
#24
11-5-02

Docket No.: 49959-013

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	: RESPONSE UNDER 37 CFR 1.116 : EXPEDITED PROCEDURE
Ariel BEN-PORATH, et al.	:
Serial No.: 09/111,454	: Group Art Unit: 2623
Filed: July 08, 1998	: Examiner: V. Bali

For: AUTOMATIC DEFECT CLASSIFICATION WITH INVARIANT CORE CLASSES

RESPONSE UNDER 37 CFR 1.116

Box AF
Commissioner for Patents
Washington, DC 20231

Sir:

The following remarks are submitted in response to the Office Action mailed August 26, 2002

Claims 1-3, 6-20, 23-38 and 40-63 are pending in the application. Claims 9-17, 26-34 and 49-60 have been withdrawn from consideration.

Claims 1-3, 6-8, 18-20, 23-25, 37, 38 and 40-42 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,801,965 (Takagi) in view of U.S. Patent 5,814,829 (Broude) and further in view of U.S. Patent 4,849,901 (Shimizu). Claims 35, 36 and 43-45 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takagi, Broude and Shimizu and further in view of U.S. Patent 5,591,971 (Shahar). Claims 46 and 47 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takagi in view of Shahar. Claim 48 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Takagi and Shahar and further in view of U.S. Patent 5,960,106 (Tsuchiya). These rejections are respectfully traversed. Applicants

respectfully request reconsideration and allowance of the claims in view of the following arguments.

The present invention and the cited references were discussed in detail in Applicants' Amendment of June 4, 2002. For convenience, Applicants refer the Examiner to that discussion.

Regarding the obviousness rejection of independent claims 1, 18, and 37 based on Tagaki, Broude and Shimizu, none of these references teaches or suggests classifying each detected defect into one of a predetermined number of invariant core classes, as required by claims 1, 18 and 37. A sample invariant classification scheme according to the present invention is illustrated at Fig. 1 of the application, showing seven invariant core classes 3A-3E, into which all defects are classified. This invariant classification scheme is an important feature of the present invention because it enables standardization of defect classification, resulting in ready determination of the causes of defects compared to prior art inspection techniques, and the ability to use the present invention upon start-up and ramp-up of production.

It is contended in the Office Action that Tagaki teaches classifying defects into invariant core classes, as claimed. However, this is not an accurate characterization of Tagaki's teaching. As explained at col. 12:3-26 of Tagaki, its defect classes are changed (i.e., the number of classes are expanded) depending on how the defects fit into a constantly evolving classification model. If a defect falls outside or in between "clusters" in the classification space of Tagaki's classification model, a new cluster is made, and/or the operator is asked to classify the defect. Thus, Tagaki's classification scheme is the opposite of the claimed invariant classification technique. It is infinitely variable, allowing a new category to be made for each defect, if necessary. Tagaki is analogous to the prior art defect classification schemes, discussed at pages

2-3 of the present application, which lack standardized defect classes. In contrast, the claimed invention classifies each defect into one of a very limited number of invariant core classes.

It is further contended in the Office Action, at paragraph 7, that since Tagaki teaches using standard classification models to classify defects at any given time, Tagaki is teaching classifying defects into one of a predetermined number of invariant core classes, as claimed. The Examiner is contending the claim term "invariant core classes" covers the standard but changeable defect classes taught by Tagaki. Applicants submit that this is an unreasonably broad interpretation of the language of independent claims 1, 18 and 37, since it effectively renders the term "invariant" meaningless as used in those claims. The Examiner is improperly eliminating (or "reading out") the term "invariant" from the phrase "invariant core classes" as used in the claims by giving it an interpretation so broad that it is contrary to the term's ordinary meaning.

It is well-established that the words of a claim must be given their plain meaning unless they are otherwise defined in the specification (see MPEP § 2111.01). In the present case, the plain meaning of the word invariant is "unvarying" or "constant". See, e.g., ***Random House Webster's Unabridged Dictionary***, Second Edition, Random House 1998. Further, the specification does not contradict the plain meaning or indicate any special meaning. Thus, in light of the plain meaning of "invariant", it is not reasonable to interpret the claimed "invariant core classes" as including Tagaki's changeable classes. It is not reasonable to equate something explicitly described as invariant or constant, such as the claimed invariant core classes, to something that is changeable, such as Tagaki's defect classifications.

While one skilled in the art may consider Tagaki's classification models (see Tagaki Fig. 3, reference numeral 352) to be "core classes" at any given time, Applicants submit that one skilled in the art would not consider them to be *invariant* core classes, as claimed, since they are

taught by Tagaki to be subject to change over time. In other words, Tagaki teaches *variant* core classes, rather than *invariant* core classes, as claimed. See col. 11:65 to col. 12:22 of Tagaki. The language of independent claims 1, 18 and 37 clearly distinguishes the claimed invention over Tagaki, if the claim terms are given their plain meaning, as required by the law.

Since none of the cited references teaches or suggests the step of classifying each defect into one of a predetermined number of invariant core classes, as required by independent claims 1 and 18, or teaches or suggests independent claim 37's processor for performing this step, no combination of the references, however made, could yield the invention of claims 1, 18 or 37, and it would not have been obvious to modify any Tagaki/Broude/Shimizu combination to yield the claimed invention.

Moreover, even assuming, ***arguendo***, that the references taught all the recited features of claims 1, 18 and 37, it would not have been obvious to combine Tagaki and Broude as the Examiner suggests. It is contended in both the current and previous Office Actions that it would have been obvious to combine Takagi's defect inspection and classification technique with Broude's teaching of inspecting for defects, mapping and counting the defects and generating a signal when a threshold number of defects of a particular size and/or at a particular location are found, to thereby yield the invention of claims 1, 18 and 37.

Applicants disagree. As explained in the June 4 Amendment, the Examiner has not provided an objective teaching in either reference that would have motivated a skilled artisan to incorporate Broude's teaching into Takagi's system, because none exists. The purpose of Takagi's semiconductor device defect classification system is to extract feature data of the defects based on their classification, feed back this information to improve the automatic inspection process, use this information to determine the cause of the defects, and control the

manufacturing machinery accordingly, to avoid further defects and improve yield. These functions are explained in Takagi at, for example, col. 5, line 27 to col. 6, line 9 with reference to Fig. 1.

Broude relates to a photolithographic mask (or "reticle") inspection system wherein when a threshold number of reticle defects of a particular size at a particular location is exceeded, the inspection is interrupted and the operator informed, so that time is not wasted continuing inspection of a low-quality reticle (see, e.g., col. 5, lines 47-67). In other words, Broude's system is for efficiently discovering and rejecting reticles that do not meet predetermined quality standards.

Tagaki's purposes would not be furthered by Broude's defect counting and signaling technique. Broude's approach to inspection is much different than Tagaki's, and is used in a different context. Broude's technique is for inspecting completed masks before they are used in production to weed out low-quality masks (i.e., a "go/no-go" test). In contrast, Tagaki improves product yield during production by using defect feature data from the inspection process to improve its inspection process, to determine the cause of the defects, and to adjust the operating parameters of its manufacturing machinery to prevent further defects. None of these functions are performed by Broude's inspection methodology, and none of Tagaki's goals would be served by modifying it with Broude's defect counting and display/inspection shutdown technique. Moreover, there is no objective teaching in Tagaki's yield improvement methodology relating to Broude's functions of defect counting resulting in inspection shutdown, or vice versa. Therefore, a skilled artisan would not have been motivated to add Broude's defect counting and display/inspection shutdown technique to Tagaki's inspection system to yield the invention of independent claims 1, 18 and 37.

It is contended by the Examiner that a skilled artisan would have been motivated to incorporate Broude's counting and display/shutdown features into Tagaki's inspection system to generate a signal to stop the process to get a better yield (see page 4). However, there is no support in either reference for this contention. As discussed above, Broude teaches counting defects, displaying the results and shutting down the inspection process to reject a low-quality reticle, not to improve the yield of the reticle manufacturing process (or of any other manufacturing process). Broude's process is not used for in-process inspection, where yield is an issue, but rather is used after completion of a reticle and before production using the reticle begins.

Moreover, stopping or slowing down the process to improve yield is not taught or even suggested as a desirable action in Tagaki. Rather, Tagaki arguably teaches away from such action by teaching the use of its inspection results to determine the causes of defects and to adjust the production parameters accordingly, thereby improving yield. Furthermore, Takagi teaches selecting and segregating defective products for repair by an automatic or manual "repair unit" (see col. 6, lines 39-59). Takagi's production line does not need to be slowed or stopped, as suggested in the Office Action, since Tagaki teaches an alternative technique for dealing with defective products. Such action would defeat the purpose of Tagaki's automated inspection/repair/process control system. It is well-established that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. ***In re Gordon***, 733 F.2d 900 (Fed.Cir. 1984); ***In re Ratti***, 270 F.2d 810 (CCPA 1959)(If a proposed modification or combination would change the principle of operation of the prior art invention being modified,

then the teachings of the references are not sufficient to render the claims prima facie obvious); MPEP § 2143.01.

The Examiner is using improper hindsight here, using the Applicants' disclosure (of their motivation for making the invention) against them. There is no objective teaching in the art offered in support of the Office Actions' stated motivation to combine the Takagi and Broude references. Furthermore, the cited Shimizu reference does not furnish any such objective teaching either. Indeed, it is not even alleged in the Office Actions that Shimizu furnishes such a teaching. Thus, the statement in the Office Actions offered to show motivation to combine Tagaki and Broude with Shimizu to yield the claimed invention is speculative, and cannot support a rejection under 35 U.S.C. § 103.

Consequently, independent claims 1, 18 and 37 are patentable, as are claims 2, 3, 6, 7, 8, 18-20, 23-25, 37, 38 and 40-42, which depend from claims 1, 18 and 37.

Further regarding dependent claims 6, 23 and 41, none of the cited references teaches or suggests the recited feature of claims 6, 23 and 41 of further classifying one of the defects into a variant subclass. It is contended in the Office Action that Takagi teaches this feature; however, the cited passage of Takagi does not provide support for this contention. This passage relates to linking a defect class with a cause, not to further classifying defects that have been classified into subclasses of a particular class, as claimed. Consequently, claims 6, 23 and 41 are further and separately patentable.

Regarding the obviousness rejection of dependent claims 35, 36 and 43-45 based on Tagaki, Broude, Shimizu and Shahar, the Shahar reference does not furnish the necessary motivation to combine Tagaki, Broude and Shimizu to yield the computer readable medium of

independent claim 18, from which claims 35 and 36 depend, or the apparatus of independent claim 37, from which claims 43-45 depend.

Consequently, claims 35, 36 and 43-45 are patentable.

Regarding the rejection of independent claim 46 based on Tagaki and Shahar, neither cited reference teaches or suggests the important step of classifying each defect into one invariant core class, as recited in claim 46. Furthermore, neither reference teaches or suggests the claimed step of imaging with both an SEM and an optical imager. Takagi teaches optical imaging only, and does not mention SEM imaging or the claimed combination of SEM and optical imaging. See Tagaki col. 15, line 15 et seq. Shahar teaches SEM imaging only. Applicants note that Shahar's detectors 240, 250 are explicitly described as electron detectors, not optical detectors as contended in the Office Action. Moreover, claim 46 requires both optical and SEM *imaging* of a defect, not simply *detecting* light and electron emissions. Shahar does not teach optical imaging, only SEM imaging, so even if its detectors 240, 250 are capable of detecting light, Shahar still does not teach the SEM/optical imaging step of claim 46, since it does not teach or suggest optical imaging. Since neither reference teaches or suggests the above-discussed SEM/optical imaging step of claim 46, any combination of Tagaki and Shahar, however made, would still be missing this step. Moreover, it would not have been obvious to add this step to any Tagaki/Shahar combination. There is no objective teaching offered to support the contention in the Office Action that a skilled artisan would have been motivated to add an SEM to Takagi's apparatus to obtain a better perspective of the image. This contention is speculative and cannot support an obviousness rejection.

Consequently, claim 46 is patentable, as is claim 47, which depends from claim 46.

Regarding the obviousness rejection of dependent claim 48 based on Tagaki, Shahar and Tsuchiya, the Tsuchiya reference does not furnish a teaching or suggestion of the important step of imaging with both an SEM and an optical imager of independent claim 46, from which claim 48 depends, missing from Tagaki and Shahar. Thus, any combination of Tagaki, Shahar and Tsuchiya, however made, would still be missing this step, and it would not have been obvious to add this step to any Tagaki/Shahar/Tsuchiya combination.

Consequently, claim 48 is patentable.

Reconsideration and withdrawal of the rejection of claims 1-3, 6-8, 18-20, 23-25, 35-38 and 40-48 under 35 U.S.C. §103(a) are respectfully requested.

Regarding independent claims 61-63, these claims are patentable over the cited references because the references do not, alone or in combination, teach or suggest classifying each defect into one of a predetermined number of invariant core classes, as recited in these claims.

Accordingly, it is believed that all pending claims are now in condition for allowance. Applicant therefore respectfully requests an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicant's representative at the telephone number shown below.

To the extent necessary, if any, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

Michael A. Messina

Michael A. Messina
Registration No. 33,424

600 13th Street, N.W.
Washington, DC 20005-3096
(202)756-8000 MAM:mcm
Facsimile: (202)756-8087
Date: October 28, 2002